2000 Annual Mercury Report

Mercury Contaminant Levels in Louisiana Biota, Sediments and Surface Waters

1994-2000

Louisiana Department of Environmental Quality
Environmental Planning Division
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INTRODUCTION

Mercury contamination of fish is a widespread problem throughout much of the United States and other countries. Levels of mercury in fish sufficient to exceed the U.S. Food and Drug Administration (FDA) action level of 1 part per million (ppm) have been found from many water bodies, including some in Louisiana (Cormier, 1995: LDEQ, 1993; LDEQ, 1995; LDEQ, 1997). Mercury is the primary cause of fish consumption advisories in the United States, accounting for 60 percent of all water bodies with an advisory. A total of 41 states have advisories due to mercury contamination of fish, and twelve states have statewide mercury advisories (U.S. EPA Fact Sheet 823-F-00016, 2000). Louisiana's first advisory due to mercury was initiated in August 1992 for a stretch of the Ouachita River from the Arkansas border to the lock and dam at Columbia, LA. The Louisiana Department of Health and Hospitals (LDHH) and the Louisiana Department of Environmental Quality (LDEQ) issued this advisory. As of July 2001, 19 separate advisories on 19 Louisiana water bodies have been issued as a result of mercury contamination of fish (Table 1).

The Louisiana Departments of Health and Hospitals and Environmental Quality coordinate in the assessment of data for health risks and jointly issue advisories if warranted. The Louisiana Departments of Wildlife and Fisheries, and Agriculture and Forestry are also apprised of the situation and asked to comment. LDHH uses a limited meals approach in establishing health advisories. LDHH will consider issuing a health advisory limiting fish consumption for pregnant or breast feeding women and children less than 7 years of age for locations where the average concentration of mercury exceeds 0.5 parts per million (ppm) in fish and shellfish. At average concentrations exceeding 1.0 ppm, LDHH will recommend limited meals or no consumption for pregnant or breast feeding women and children less than 7 years of age and limited consumption for the general population. In addition, LDHH considers other types of information when making advisory decisions. These considerations include, but are not limited to, information on sensitive subpopulations and local fish consumption practices that can affect exposure, the number of samples within a species, and the size and number of fish collected. FDA uses a maximum allowable mercury level of 1.0 ppm in fish which was established to protect consumers at mercury concentrations 10 times lower than the lowest levels associated with the initial adverse effects of mercury (Foulke, 1994).

LITERATURE REVIEW

Characteristics of Mercury in the Environment

Mercury is released into the environment in either elemental or ionic form. Ionic mercury tends to be deposited in the same region as the source, while elemental mercury usually enters the global atmospheric reservoir. Once in the atmosphere it can circulate for approximately one year and travel long distances from the sources (U.S. EPA Website, 1999). While mercury is generally released in its elemental or ionic form, methylmercury is the form predominantly bioaccumulated by fish and stored in muscle tissue (Schofield, 1994). The methylation of inorganic mercury seems to be enhanced by the presence of clear, low pH water (Lange et al., 1993; Wiener et al., 1990a and 1990b). Methylation rates of mercury also tend to be higher in freshwater compared to saltwater. There are numerous potential sources of mercury to Louisiana waters, including atmospheric deposition, natural geologic deposits, industrial/municipal discharges, previously contaminated sediment, and fugitive sources such as discarded batteries or containers of elemental mercury (Krabbenhoft and Rickert, 1995; Gordon, LDEQ undated). Inorganic mercury in water bodies is primarily bound to the sediment, and only

found at extremely low concentrations in the water column (Beckvar et al., 1994; LDEQ, unpublished data). However, presence of mercury in the sediments of a water body is not alone sufficient to produce a contamination problem in fish (LDEQ, 1995) Water conditions, as described above, must also be conducive to methylation of inorganic mercury for significant accumulations in fish to occur.

Mercury levels tend to increase at higher trophic levels through biomagnification. Small aquatic organisms pick up methylmercury and transfer it to larger organisms when they are eaten. Because methylmercury is almost completely absorbed in the digestion process, the level of methylmercury becomes magnified as progressively larger predators ingest organisms that are contaminated by mercury. When the rate of uptake exceeds the depuration rate, concentrations in fish begin to increase, potentially leading to hazardous contaminant levels for human consumption. Large predators such as adult largemouth bass (*micropterus salmoides*) and bowfin (choupique, *Amia calva*) tend to have the highest levels of mercury contamination in rivers and lakes (LDEQ, 1995). For mercury, the biomagnification rate is so extreme that despite a mean mercury concentration of 0.002 ppb for Minnesota lakes, fish concentrations often exceeded 0.45 ppm (Sorensen et al., 1990). This amounts to a bioaccumulation factor of 225,000. In summary, mercury poses a threat to humans primarily through the consumption of large predatory fish from water bodies where mercury is present and water conditions promote methylation of mercury into a form that aquatic organisms bioaccumulate.

Risks to Fish and Wildlife

Besides posing a human health risk, elevated levels of mercury in fish can also have ecologically significant effects, such as affecting reproduction (Beckvar et al., 1994; Wiener, 1995). Although fish can generally excrete inorganic mercury, methylmercury, which crosses biological barriers more easily, is not readily excreted or sequestered in a form that is less harmful to the fish (Wiener, 1995). Because of the ease with which methylmercury crosses biological barriers, embryonic fish are at a much higher risk of mortality than adults even at mercury concentrations 1% to 10% lower than concentrations associated with adult mortality in fish (Wiener, 1995).

Among terrestrial wildlife, top predators of the aquatic food chain tend to have the highest concentrations of mercury. Such species include raccoons (*Procyon lotor*), mink (*Mustela vison*), otters (*Lutra canadensis*), cougars (*Felis concolor coryi*) and fish-eating birds such as eagles (*Haliaeetus leucocephalus*), ospreys (*Pandion haliaetus*) and great blue herons (*Ardea herodius*). Mercury levels in a female Florida panther were 130 ppm in hair and 110 ppm in the liver. The Florida panther, an endangered species, subsists largely on a diet of raccoons (Facemire, 1995). Effects on terrestrial wildlife are similar to those of aquatic organisms and range from adverse effects on growth and reproduction to behavioral effects to mortality. The U.S. Fish and Wildlife Service (USFWS) has found high concentrations of mercury in raccoon and great blue herons sampled in the Upper Ouachita and D'Arbonne National Wildlife Refuges (USFWS, 1994). This finding led the USFWS to issue an advisory recommending no consumption of raccoons or fish from either refuge.

Risks to Human Health

The primary route of exposure to methylmercury in Louisiana is consumption of locally caught fish. Subsistence fishermen are at a much higher risk than the general population. Adverse effects on the nervous system, particularly in developing fetuses and young children among whom effects can be permanent, is of primary concern with mercury contamination.

Paresthesia, which consists of numbness and tingling of lips, fingers and toes, is generally the first symptom of mercury poisoning. Continued exposure results in stumbling, slurred speech, constricted visual fields, and impaired hearing. In extreme cases tremors and jerks can occur, followed by coma and death.

Doctors continue to recommend fish as an important, low-fat source of protein. However, it is important to understand the true nature of the risks described above when consuming fish caught in mercury advisory water bodies, particularly when fetuses and small children are involved. Methylmercury is stored in the muscle tissue of fish rather than the fat; therefore, unlike other contaminants, cleaning and trimming the fish before eating does little to reduce the risk of exposure. Despite this fact, it is possible to consume fresh caught fish from mercury advisory water bodies and still reduce the potential risks caused by mercury contamination. The most important factor is to read and understand the fish consumption recommendations for all advisories related to mercury and other contaminants. These advisories will tell you which fish are safer to eat and what portion of the population, for example pregnant or lactating women, small children or adults, are most affected by the advisory. In many cases non-pregnant or non-lactating adults and children over seven years of age can consume any fish taken from advisory water bodies. In other cases, people can still consume those species present in the water bodies advisory, provided they reduce the frequency of that consumption to one or two meals per month. Secondly, consuming younger, smaller fish and those lower on the food chain such as bluegill sunfish (*Lepomis machrochirus*), warmouth (*Lepomis gulosus*) and channel catfish (*Ictalurus punctatus*) is advised because these fish tend to contain less mercury. Finally, consume fish from a variety of locations. All of the regularly fished and popular Louisiana water bodies have been tested for the presence of mercury in fish and many of these have been found to be completely safe. By diversifying your diet the likelihood of consuming a sufficient number of fish with high enough levels of contamination to cause harm is extremely unlikely.

Thus far, despite all the fish and seafood consumed in Louisiana, there have been no confirmed cases of mercury poisoning in the state. By following the few simple rules outlined above families can continue to enjoying fishing, and eating what they catch, without causing any harm. Table 1 is a list of all fish consumption advisories related to mercury in Louisiana. Four new advisories were added in November of 2000 and one in July 2001, which supersedes the two previous advisories for Toledo Bend Reservoir. Figures 1-22 are maps of each fish consumption advisory area.

Table 1.
Fish consumption advisories related to mercury contamination in Louisiana water bodies. As of June 2001.

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
Ouachita River LA/AR border to lock at Columbia	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age should consume no bass (all species), and limit consumption of all other species to TWO MEALS PER MONTH. Non-pregnant women, men, and children >=7 years of age should limit bass to TWO MEALS PER MONTH with no limit on other species.[1]	102 miles	07/29/92 reviewed 8/94
Henderson Lake area including Lake Bigeux	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age limit consumption of largemouth bass, crappie, and freshwater drum to ONE MEAL PER MONTH. No limit on other species or for the general population.[1]	37.8 square miles	03/04/96
Bayou Plaquemine Brule	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age consume no bowfin (choupique),and limit consumption of largemouth bass, crappie, or freshwater drum to ONE MEAL PER MONTH. Non-pregnant women, men, and children	40 miles Origin near Opelousas to the Mermentau River	10/96

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
			>=7 years of age should limit bowfin to TWO MEALS PER MONTH, with no limit on other species.		
Black Lake	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age consume no bowfin (choupique), and limit consumption of largemouth bass, white bass, or crappie to ONE MEAL PER MONTH. Non-pregnant women, men, and children >=7 years of age should limit bowfin to TWO MEALS PER MONTH, with no limit on other species.	8 square miles	10/96
Bogue Chitto River	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age should limit consumption of bass (all species) or bowfin (choupique) to ONE MEAL PER MONTH. There is no consumption limit on any species for non-pregnant women, men, and children >=7 years of age.	35 miles From the LA/MS state line to the Pearl River Navigation Canal	8/96
Pearl River	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age should consume no bowfin (choupique), and limit consumption of	57 miles This advisory includes the entire Pearl River	2/97

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
			bass (all species), freshwater drum or bigmouth buffalo to ONE MEAL PER MONTH. Non-pregnant women, men, and children >=7 years of age should CONSUME NO BOWFIN, with no consumption limit on other species.[1]		
Bayou Liberty	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age should limit consumption of largemouth bass, white/black crappie, and freshwater drum to ONE MEAL PER MONTH.[1] This same group should limit consumption of redear sunfish to TWO MEALS PER MONTH. There is no consumption limit on any species for non-pregnant women, men, and children >=7 years of age.	10 miles From origin near Slidell, LA to Lake Pontchartrain	2/97
Chicot Lake	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age should consume no bowfin (choupique), and limit consumption of largemouth bass to ONE MEAL PER MONTH. Non-pregnant women, men, and children >=7 years of age should limit	2.54 square miles	5/27/97

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
			consumption of bowfin to TWO MEALS PER MONTH. There is no consumption limit on other species.[1]		
Seventh Ward Canal	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age should eat no more than a total of ONE MEAL PER MONTH of these fish combined: bowfin (choupique), white crappie (sac-a-lait), flathead catfish and freshwater drum.1 There is no consumption limit on other species of fish.1 There is no consumption limit on any species for non-pregnant women, men, and children >=7 years of age.[1]	11.5 miles At Origin near Moulan Canal to the Intracoastal Waterway	6/25/97
Lake Vernon	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age should eat no more than a total of ONE MEAL PER MONTH of the following fish, combined: largemouth bass, flathead catfish, redear and bluegill sunfish (bream). There is no consumption limit on other species of fish. There is no consumption limit on any species for	4,224 acres	8/5/97

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
			non-pregnant women, men, and children >=7 years of age.[1]		
Gulf of Mexico off Louisiana Coast	Mercury	Advisory fish consumption	**For king mackerel 39 inches or less in total length:** Pregnant/breast-feeding women and children <7 years of age should eat no more than ONE MEAL PER MONTH. 1 Non-pregnant women, men, and children >=7 years of age should limit consumption to TWO MEALS PER MONTH. **For king mackerel greater than 39 inches in total length:** No consumption for all individuals. There is no consumption limit on other species of fish. [1]	Not determined	9/4/97
Bayou des Cannes	Mercury	Advisory fish consumption	Pregnant/breast-feeding women and children <7 years of age should eat no more than ONE MEAL PER MONTH of the following fish, combined: bowfin (choupique), black crappie or freshwater drum (gaspergou). There is no consumption limit on other species of fish. There is no	54 miles From origin near Ville Platte to the Mermentau River	10/9/97

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
			consumption limit on any species for non-pregnant women, men, and children >=7 years of age. [1]		
Blind River	Mercury	Advisory fish consumption	Pregnant/breast-feeding women, women planning to be pregnant, and children < 7 years of age should limit their consumption of bowfin (choupique) to ONE MEAL PER MONTH. There is no consumption limit on other species of fish. There is no consumption limit on any species of fish for non-pregnant women, women not breast-feeding or planning to become pregnant, men, and children >=7 years of age. [1]	25 miles From origin to Lake Maurepas	04/27/98
Bayou Bartholomew	Mercury	Advisory fish consumption	Pregnant/breast-feeding women, women planning to be pregnant, and children < 7 years of age should limit their consumption of all fish species to ONE MEAL PER MONTH. There is no consumption limit on any species of fish for non-pregnant women, women not breast-feeding or planning to become pregnant, men, and children >=7 years of age. [1]	69 miles From the LA/Arkansas state line to the Ouachita River	01/21/99

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
West Fork Calcasieu River	Mercury	Advisory fish consumption	Pregnant women, breast-feeding women, women planning to be pregnant, and children less than seven years of age should NOT consume largemouth bass, bowfin, or freshwater drum from the advisory area. There are no limits on other species. Non-pregnant women, women not planning to become pregnant, men, and children seven years of age and older should consume no more than TWO MEALS PER MONTH of bowfin, largemouth bass, and freshwater drum combined from the advisory area. There are no limits on other species.[1]	16.5 Miles– WestFork Calcasieu River from the junction of Hickory Creek and Beckwith Creek to the confluence with the Calcasieu River	11/20/00
Ivan Lake	Mercury	Advisory fish consumption	Pregnant women, breast-feeding women, women planning to be pregnant, and children less than seven years of age should NOT consume bowfin from the advisory area and should consume no more than ONE MEAL PER MONTH of largemouth bass. There are no limits on other species.	369 Acres	11/20/00

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
			Non-pregnant women, women not planning to become pregnant, men, and children seven years of age and older should consume no more than TWO MEALS PER MONTH of bowfin but do not have to limit consumption of other species.		
The Little River at Bodie's Landing (including Catahoula Lake)	Mercury	Advisory fish consumption	Pregnant women, breast-feeding women, women planning to be pregnant, and children less than seven years of age should NOT consume largemouth bass, freshwater drum, flathead catfish, or bowfin from the advisory area and should consume no more than TWO MEAL PER MONTH of white crappie. There are no limits on other species. Non-pregnant women, women not planning to become pregnant, men and children seven years of age and older should consume no more than TWO MEALS PER MONTH of largemouth bass, freshwater drum, flathead catfish, and bowfin combined from the advisory	i58.25 miles– Hwy 500 to Catahoula Lake 18797.36 Acres- Catahoula Lake 11 miles- Little River from Catahoula Lake to weir near Archie	11/20/00

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
			area. There are no limits on other species.		
Bayou De Loutre and Associated Lakes	Mercury	Advisory fish consumption	Pregnant women, breast-feeding women, women planning to be pregnant, and children less than seven years of age should NOT consume any species of fish form the advisory area. Non-pregnant women, women not planning to become pregnant, men, and children seven years of age and older should consume no more than TWO MEALS PER MONTH of any species of fish combined form the advisory area.[1]	22.5 miles- From Hwy. 33 to the Ouachita River, including Phillips Lake, Hatley Lake, and Hudson Lake	11/20/00
The Toledo Bend Reservoir **This advisory supersedes the two previous advisories issued for this water body on Nov. 17, 1997**	Mercury	Advisory fish consumption	Pregnant women, breast-feeding women, women planning to be pregnant, and children less than seven years of age should NOT consume bowfin from the advisory area and should consume no more than ONE MEAL PER MONTH of largemouth bass or freshwater drum. There are no limits on other species. Non-pregnant women, women not planning to become	Toledo Bend Reservoir north of the Sabine River Authority Recreation Site 15 located at Pleasure Point Rd. The waters south of Recreation Sit 15 (including South Toledo Bend State Park) are not included in this advisory.	7/19/01

Description	Suspected Cause	Advisory Type	Advisory	Area	Date Issued
			pregnant, men, and children over seven years of age and older should consume no more than TWO MEALS PER MONTH of bowfin but do not have to limit consumption of other species from the advisory area		

1. One meal is considered to be one half pound of fish
Henderson Lake advisory includes Henderson Lake, Lake Bigeux, and all waters within the area bounded on the north by the St. Landry-St. Martin Parish Line, on the east by the West Atchafalaya River levee (Hwy. 3177), on the south by Hwy. 3177 and on the west by the West Atchafalaya Basin levee.

Sources of Mercury in Louisiana

The most common point sources of mercury are chlor-alkali plants, hazardous waste incinerators, municipal waste incinerators, chemical manufacturing plants, and coal-fired utilities. Due to public interest, a summary of mercury emissions and surface water discharges are included in this report. Mercury is discharged either directly into the surface water or into the air. Mercury in the atmosphere is deposited into surface water primarily by wet deposition. Atmospheric residence time for gaseous emissions of mercury is estimated at one year, increasing the likelihood of transport to other regions. (Schroeder, 1998). Because of the nature of atmospheric mercury, the concentrations of mercury in Louisiana surface waters cannot be directly traced to air emissions from the facilities located within Louisiana. Twenty-six facilities are currently included in LDEQ's Toxic Emission Data Inventory (TEDI). Three facilities in Louisiana currently have reported mercury surface water discharges to the Toxic Release Inventory (TRI). The TRI facilities all discharge to the Mississippi River with the exception of PPG Industries which discharges to the Calcasieu River. Despite testing, none of the water bodies receiving mercury discharges based on TRI have been found to require a fish consumption advisory.

Table 2.

Mercury and mercury compounds discharged directly to Louisiana surface water, as reported to Toxic Release Inventory (TRI). Sum of release estimates reported in pounds per year

Facility Name	Annual Mercury Releases in pounds												
	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Borden Chemicals & Plastics Operating L.P.	1	9	9	12	11	14	18	17	18	17	17	0	143
Pioneer Chlor-Alkali Co. Inc.	250	18	27	17	17	18	0	0	20	23	26	21	416
PPG Inds. Inc.	12	15	0	12	11	24	10	5	4	22	0	0	115
Total	263	42	36	41	39	56	28	22	42	62	43	21	695

Table 3.

Mercury air emissions in Louisiana, as reported to Toxic Emission Data Inventory (TEDI). Sum of release estimates reported in pounds per year.

COMPANY	**PARISH**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
BOISE CASCADE-OAKDALE PLYWOOD	Allen								910	3
RUBICON INC	Ascension	15	13	13	13	14	25	23	30	33
BOISE CASCADE - SOUTHERN OPS	Beauregard		4	3	61	56	55	48	111	60
WESTVACO	Beauregard			2	2	2	2	2	1	
CONDEA VISTA-CHEMICAL COMPLEX	Calcasieu							20		
LYONDELL CHEMICAL, LK. CHARLES	Calcasieu									0
PPG INDUSTRIES, INC.	Calcasieu	1,210	1,208	1,238	1,282	1,287	1,281	1,228	1,220	1,222
INTERNATIONAL PAPER-MANSFIELD	De Soto		75	66	67	218	260	240	240	40
GEORGIA PACIFIC CORPORATION	E Baton Rouge		83	81	143	73	69	73	70	2
RHODIA, INC.	E Baton Rouge									0
ROLLINS ENVIRON. SERVICES, INC	E Baton Rouge	1	2	2	9	9				
SAFETY-KLEEN	E Baton Rouge								0	0
DOW U.S.A., PLAQUEMINE SITE	Iberville	44	127		588	227	16			1
NOVARTIS CROP PROTECTION INC.	Iberville								3	15
STONE CONTAINER CORPORATION	Jackson		49	49	48	48	12	18	18	0

LA-PACIFIC CORP., URANIA CMPLX	La Salle	2	2	2	2	2				3
SUNLAND FABRICATORS/WALKER	Livingston								67	
INTERNATIONAL PAPER	Morehouse		83	66	66	99	92	91	87	87
WILLAMETTE IND.,INC. RED RIVER	Natchitoches			21	20	15	15	16	16	16
RIVERWOOD INTERNATIONAL PLNT31	Ouachita		53	54	56	16	14	14	14	20
INTERNATIONAL PAPER-PINEVILLE	Rapides		45	46	47	2	95	60	57	60
UNION CARBIDE	St Charles	1				3	3	4	3	1
MARINE SHALE PROCESSORS. INC.	St Mary	30	25	22						
GAYLORD CONTAINER CORPORATION	Washington		91	80	87	83	85	90	89	88
CROWN PAPER COMPANY	West Feliciana					29		20	20	29
JAMES RIVER CORP.	West Feliciana		14	27	27					
Yearly Totals		1,303	1,874	1,772	2,518	2,183	2,024	1,947	2,956	1,680

LDEQ'S MERCURY MONITORING PROGRAM

Past Data Assessment

Since at least 1986, LDEQ has conducted analysis to detect mercury contamination of fish from several water bodies throughout the state (Cormier, 1995; LDEQ, 1993; LDEQ, 1995; LDEQ, 1997; LDEQ, unpublished data). Mercury levels in edible portions of some species exceeding 0.5 ppm were found in several areas. In January and July 1990 largemouth bass samples from the Tangipahoa River had mercury levels of 1.02 and 0.67 ppm, respectively (LDEQ, unpublished data). An Amite River largemouth bass sample collected in September 1990 was found to have 0.94 ppm mercury in edible tissue (LDEQ, unpublished data). Two of three largemouth bass samples from the Bogue Chitto River collected in July 1990 exceeded 0.5 ppm mercury (0.78 and 1.18 ppm) (LDEQ, unpublished data). In contrast, fish collected by LDEQ from the Mississippi River since 1990 did not have elevated mercury levels (Henrich et al., 1995).

Ouachita River fish have been sampled on numerous occasions, with high levels of mercury often observed in the composite samples. The first sampling event took place in September of 1990 south of the Arkansas line. Three largemouth bass samples collected in September 1990 south of the Arkansas line had mercury levels of 0.96-1.29 ppm. In subsequent sampling events in the Ouachita River, bass, blue catfish, and common carp (*Cyrinus carpio*) all had levels of mercury greater than 0.5 ppm. During the fall of 1993, twelve North Louisiana lakes were sampled with widely varying results. Lakes Bistineau, D'Arbonne, Wallace, and Cheniere all had at least one fish exceeding the 1 ppm level. (LDEQ, 2000).

Objectives

The primary objective of this project is to determine statewide mercury contamination levels of fish commonly eaten in Louisiana, as well as mercury concentrations in sediments, water, and epiphytic plant material collected at the same locations. Fish tissue information will provide input for analyses of risks to human health due to consumption of mercury contaminated fish. This will allow LDHH and LDEQ to address public concerns regarding the safety of fish consumption from many water bodies. Epiphytic plant material will be used to help assess the significance of atmospheric sources of mercury. Results of the epiphytic plant material analyses, together with the fish tissue, water and sediment concentration information, may help address questions regarding sources of mercury. By combining data generated by this and previous projects with the knowledge of LDEQ field personnel regarding potential sources of mercury, it is hoped that additional remedial actions can be found. Additionally, this project will provide baseline data that can be used for trend analysis to determine whether the contamination problem is improving, getting worse, or remaining stable.

Fish, Water, Sediment and Plant Sampling

Recreationally-fished water bodies throughout Louisiana, especially those with water chemistry characteristics promoting methylation of mercury were targeted for sampling. Initially, a prioritized list of recommended sampling locations was compiled by personnel in the Acadiana, Bayou Lafourche, Capitol, Kisatchie Central, Southwest, and Southeast Regions (LDEQ, 2000).

Current site selection is based on several sampling needs. New sites are sampled in order to expand the extent of water bodies tested. Recently, sites have been selected in basin

subsegments in which no previous sampling has occurred. In the next few years, all promulgated water bodies should be sampled for mercury contamination. Water bodies currently under an advisory for mercury are resampled annually. Finally, some water bodies are resampled if LDHH determines additional samples are needed to make a decision regarding the need for advisories. Guided by these needs, LDEQ is endeavoring to sample a total of 100 sites per year.

At each site, fish tissue samples, water samples, sediment samples, and when available, plant samples are collected. Since 1994, fish and sediment samples were analyzed for total mercury concentration. In June of 1999, LDEQ began analyzing sediment samples for grain size and loss on ignition. Grain size and loss on ignition data are not yet available for all key sites. In the future, this data will be examined for correlations between these parameters and mercury concentrations. All water samples are analyzed for total mercury, sulfates, and alkalinity.

As of December, 2000 371 sites on 200 water bodies have been tested as part of the statewide mercury project. All data presented in this report was collected prior to that date. Some sites have been retested one or more times to confirm the presence of high concentrations of mercury in fish tissue. All sampling locations were described by latitude and longitude, and site location information and identification numbers were entered into the LDEQ sites (STS) data file. A Trimble Pathfinder was used in the field to determine coordinates for the sampling locations by sampling continuously for three minutes. Data was post-processed with data collected by the Trimble 4000 community base station located at LDEQ's main office in Baton Rouge.

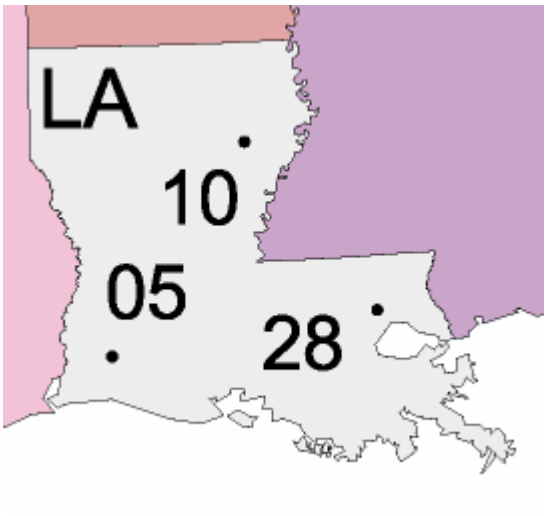
A complete listing of sample sites, along with summary information, as of December, 2000 can be found in Table 4.

Air Monitoring

Beginning in October 1998, LDEQ implemented an air monitoring program designed to assess the geographical extent and quantity of mercury deposition from the atmosphere. Air monitors were set up at the Southeastern University Campus in Hammond, Louisiana, McNeese State University in Lake Charles, Louisiana, and at the Louisiana State University sweet potato farm in Chase, Louisiana. Figure 22 shows the location of all air monitoring sites for the mercury program. Samples are tested for wet deposition of total mercury during rainfall events. If possible, samples are collected on a weekly basis. LDEQ's air monitoring sites are part of the National Atmospheric Deposition Program (NADP) and the Mercury Deposition Network.

As of December, 2000, weekly data is available from October of 1998 through June, 2000. The data shows mercury levels are being detected regularly in rainwater. The data is analyzed by the NADP staff and any future reports concerning the deposition data will be published by the NADP. Any interested party may access the data at the following website: http://nadp.sws.uiuc.edu/mdn.

Figure 22.
Location of Louisiana Department of Environmental Quality air deposition monitoring sites for total mercury.



SAMPLING PROCEDURES

Fish Tissue Sampling Procedures

For the first three years, fish were collected by the LDEQ Water Quality Management Division (WQMD) Surveillance field staff and the U.S. Geological Survey (USGS) using an electroshocking rig, nets, hook and line, or traps as described in LDEQ's *Quality Control Manual For Biosurveys and Fish Community Assessments* (LDEQ, 1991a). Following completion of USGS's contract with LDEQ, sample collection was continued by Surveillance Division's (SD's) field staff. Target species included largemouth bass, channel catfish, blue catfish, crappie (*Pomoxis annularis* and *P. nigromaculatus*), and bowfin (*Amia calva*). Other appropriate species were substituted for the targeted species if those were not found; appropriate substitutes included freshwater drum (*Aplodinotus grunniens*), garfish (*Lepisosteus sp.*), striped bass (*Morone saxatilis*), white bass (*M. chrysops*) and buffalo (*Ictiobus sp.*). Fish of the same species and the same age/weight (±15%) class were composited for a sample. A Hydrolab Scout II, or equivalent water quality meter, was used to measure pH, dissolved oxygen, temperature and conductivity at a depth of one meter at each station. Field data, including lengths and weights of fish, were recorded at the time of sample collection using field forms. Fish collected from nets, hook and line, and traps were immediately placed on ice in a plastic tray inside an ice chest. Fish collected by electroshocking were retained in a live well until sampling was completed and were placed on ice after selection. Only live or freshly dead fish (red gills) were retained.

Fish sample preparation was done in the field. All equipment used to prepare the samples was first cleaned with soap and water, then rinsed with 10% nitric acid, and finally rinsed with type 1 deionized water. Equipment was cleaned between each composite prepared. Composite fish samples consisted of skinless fillets from three to ten individuals of the same species and size class. Fish were filleted with a ceramic or stainless steel blade knife. All fillets making up a

composite were divided into equal portions. The total weight of the sample was at least 250 grams. If an exceptionally large fish of one species was collected, it was analyzed individually.

Each composite was placed in a new, clear, colorless plastic Ziploc bag. The outside of the bag was labeled with a unique sample number, the date, and name of water body. Fish composite samples were placed on ice immediately after compositing and kept on ice or frozen until delivery to the laboratory.

Water and Sediment Sampling Procedures

At each fish sampling site one water and one sediment sample were also collected. Water and sediment samples were collected using the new protocol documented in the USGS, Office of Water Quality Technical Memo 94.05, as modified below (Horowitz et al., 1994). Sediment samples were collected with a Teflon coated Petite Ponar dredge. Sediment samples were placed in clean pint-sized, plastic, wide-mouth jars and placed on ice immediately after collection for transport to the laboratory. The sediment sampler was cleaned with soap and water and rinsed with type 1 deionized water. Water samples were placed in clean 6 oz. glass bottles which had been rinsed with 5% HCl. Samples were then kept at ambient temperature until being filtered through a 0.45 micron, 142-mm diameter filter. After filtration, water samples were preserved with nitric acid to a pH <2 and put on ice. Following completion of the USGS contract with LDEQ, LDEQ personnel continued sediment sampling using the same protocols.

Plant Material Sampling Procedures

Epiphytic plant material, either Spanish moss (*Tilandsia usneoides*) or lichens, from above the high water line were also sampled from some stations. Plant material was placed in labeled clear plastic bags and put on ice or frozen until delivery to the laboratory.

Laboratory Procedures

Mercury analysis was performed on tissue samples using atomic absorption spectrometry in the form of a Perkin Elmer Flow Injection Mercury System (FIMS). Sediment and water sample analysis was performed on a LDC 3200 Mercury Analysis System. Water analysis was done according to EPA Method 245.1, modified in regard to reagents and digestion containers in order for the method to work with the LDC Mercury 3200 Analyzer. Sediment analysis was done according to EPA Method 245.5, modified for compatibility with the 3200 Analyzer. Grain size analysis and loss on ignition analysis of sediment samples was done according to Cornell University procedures S1890 and S1810.

Quality Assurance/Quality Control Procedures

Procedures for quality assurance/quality control and sample chain of custody as outlined in the *Quality Assurance Project Plan Surface Water Monitoring and Analysis* were followed during this project (LDEQ, 1991b). Samples with chain-of-custody forms were delivered to the laboratories with proper log-in procedures. Field and/or equipment blanks were analyzed, as were standard reference material samples. Replicate samples of water, bottom material, and tissue were also submitted to the laboratory for analysis. Subsamples of up to 10% of all samples were delivered to a second laboratory for analysis.

Calibrations were done according to LDEQ's *Quality Assurance Project Plan Surface Water Monitoring and Analysis* (LDEQ, 1991b). Mercury analyzers were calibrated daily for each group of samples. A series of three standards plus a reagent blank, in the expected concentration range were used. Baseline drift was checked with a reagent blank after every tenth sample or more often if needed.

SAMPLING RESULTS

Fish Tissue Analysis Results

In order to facilitate quick release of this report, data is being presented in summary tables only. Complete analytical results for all fish tissue samples are provided in Appendix A.

Mean concentration by species for those water bodies under advisory are provided in Table 4. Mean and maximum fish tissue concentrations for all species combined, listed by site, are provided in Table 5.

Table 4.

Mean concentrations of mercury in fish (ppm) by species, by sites under advisory. Louisiana Department of Environmental Quality, Environmental Planning Division. 1994-December 2000.

SITE	SITE NAME	SPECIES	N	Mean	Min	Max	Std
0013	Ouachita River at Sterlington, LA	Bigmouth Buffalo	1	0.477	0.477	0.477	.
		Black Crappie	2	0.725	0.526	0.923	0.281
		Freshwater Drum	3	0.706	0.617	0.821	0.104
		Largemouth Bass	4	0.979	0.683	1.241	0.241
		Smallmouth Buffalo	1	0.436	0.436	0.436	.
		Spotted Bass	1	0.947	0.947	0.947	.
		White Crappie	2	0.633	0.532	0.734	0.143
0064	Bogue Chitto River near Bush, Louisiana	Blacktail Redhorse	1	0.139	0.139	0.139	.
		Bluegill Sunfish	1	0.097	0.097	0.097	.
		Bowfin	3	0.932	0.243	1.304	0.598
		Channel Catfish	6	0.145	0.054	0.203	0.055
		Flathead Catfish	6	0.435	0.153	0.569	0.154
		Freshwater Drum	2	0.487	0.146	0.827	0.482
		Largemouth Bass	27	0.772	0.183	1.341	0.348
		Redear Sunfish	4	0.142	0.095	0.214	0.051
		Spotted Bass	8	0.514	0.298	0.877	0.184

SITE	SITE NAME	SPECIES	N	Mean	Min	Max	Std
		Striped Bass	1	0.123	0.123	0.123	.
		Warmouth	1	0.488	0.488	0.488	.
0089	Little River southwest of Jena, Louisiana	Black Crappie	4	0.359	0.143	0.609	0.213
		Bluegill Sunfish	1	0.077	0.077	0.077	.
		Bowfin	1	1.731	1.731	1.731	.
		Channel Catfish	1	0.289	0.289	0.289	.
		Largemouth Bass	8	1.336	0.742	2.438	0.589
		Smallmouth Buffalo	1	0.516	0.516	0.516	.
		White Crappie	3	0.576	0.246	1.136	0.488
0308	Bayou Des Cannes northeast of Jennings, Louisiana	Black Crappie	4	0.494	0.177	0.865	0.291
		Bowfin	7	0.695	0.109	1.176	0.383
		Channel Catfish	3	0.394	0.001	0.611	0.341
		Freshwater Drum	11	0.599	0.091	1.059	0.293
		Largemouth Bass	12	0.325	0.001	1.129	0.287
		Smallmouth Buffalo	2	0.143	0.137	0.148	0.008
		Warmouth	1	0.001	0.001	0.001	.
		White Crappie	7	0.217	0.001	0.485	0.192
0366	Black Lake north of Natchitoches, Louisiana	Black Crappie	3	0.250	0.186	0.337	0.078
		Bluegill Sunfish	2	0.361	0.220	0.502	0.199
		Bowfin	3	1.396	0.280	2.278	1.019
		Channel Catfish	1	0.143	0.143	0.143	.
		Freshwater Drum	4	0.437	0.157	0.596	0.195
		Largemouth Bass	20	0.720	0.262	1.568	0.356
		Redear Sunfish	1	0.182	0.182	0.182	.
		White Bass	1	1.120	1.120	1.120	.
		White Crappie	3	0.514	0.367	0.615	0.130
0377	Pearl River near Bogalusa, Louisiana	Black Crappie	1	0.229	0.229	0.229	.
		Channel Catfish	3	0.076	0.049	0.101	0.026
		Flathead Catfish	2	0.356	0.205	0.506	0.213
		Freshwater Drum	4	0.385	0.085	0.733	0.304
		Largemouth Bass	7	0.468	0.036	1.004	0.323
		Smallmouth Buffalo	1	0.178	0.178	0.178	.
		White Crappie	1	0.096	0.096	0.096	.
0379	Lake Chicot south of St. Landry, Louisiana	Black Crappie	18	0.330	0.050	0.646	0.171
		Bluegill Sunfish	1	0.300	0.300	0.300	.
		Bowfin	7	1.118	0.905	1.419	0.198
		Largemouth Bass	27	0.623	0.304	1.105	0.210
		Redear Sunfish	6	0.250	0.041	0.421	0.143
		Yellow Bullhead	1	0.227	0.227	0.227	.
0436	Lake Henderson east of Henderson, Louisiana	Bigmouth Buffalo	4	0.352	0.198	0.553	0.161
		Black Crappie	23	0.374	0.116	0.989	0.219
		Blue Catfish	1	0.166	0.166	0.166	.
		Bluegill Sunfish	2	0.210	0.001	0.418	0.295
		Bowfin	14	0.393	0.197	0.824	0.186

SITE	SITE NAME	SPECIES	N	Mean	Min	Max	Std
		Channel Catfish	2	0.158	0.053	0.263	0.148
		Flathead Catfish	1	0.433	0.433	0.433	.
		Freshwater Drum	16	0.421	0.220	0.844	0.177
		Largemouth Bass	96	0.573	0.088	1.243	0.256
		Redear Sunfish	2	0.252	0.230	0.273	0.030
		Smallmouth Buffalo	2	0.124	0.001	0.247	0.174
		Spotted Bass	1	0.151	0.151	0.151	.
		Warmouth	3	0.207	0.165	0.290	0.072
		White Crappie	16	0.399	0.116	0.769	0.225
0468	Pearl River (West) east of Slidell, Louisiana	Bigmouth Buffalo	1	0.569	0.569	0.569	.
		Black Buffalo	1	0.116	0.116	0.116	.
		Black Crappie	1	0.737	0.737	0.737	.
		Blue Catfish	2	0.435	0.377	0.492	0.081
		Bluegill Sunfish	1	0.278	0.278	0.278	.
		Bowfin	3	1.552	0.536	2.815	1.160
		Channel Catfish	1	0.039	0.039	0.039	.
		Flathead Catfish	4	0.299	0.156	0.437	0.135
		Largemouth Bass	7	1.153	0.251	1.985	0.642
		Redear Sunfish	3	0.274	0.057	0.682	0.354
		Spotted Bass	2	0.897	0.856	0.938	0.058
		White Crappie	1	0.157	0.157	0.157	.
0471	Toledo Bend Reservoir south of Logansport, Louisiana	Black Crappie	3	0.177	0.100	0.255	0.078
		Blue Catfish	8	0.142	0.001	0.411	0.136
		Channel Catfish	1	0.212	0.212	0.212	.
		Largemouth Bass	15	0.538	0.194	1.202	0.311
		Smallmouth Buffalo	2	0.030	0.001	0.059	0.041
		Spotted Bass	2	0.703	0.531	0.875	0.243
		White Bass	3	0.460	0.199	0.607	0.226
		White Crappie	12	0.146	0.001	0.492	0.148
0503	Bayou Liberty near Slidell, Louisiana	Black Crappie	1	1.018	1.018	1.018	.
		Blue Catfish	1	0.064	0.064	0.064	.
		Bluegill Sunfish	3	0.302	0.057	0.780	0.414
		Channel Catfish	3	0.092	0.000	0.251	0.139
		Freshwater Drum	2	0.665	0.402	0.928	0.372
		Largemouth Bass	13	0.791	0.387	1.528	0.344
		Redear Sunfish	4	0.447	0.238	0.926	0.322
		White Crappie	2	0.607	0.244	0.970	0.513
0504	Bayou Plaquemine Brule near Mermentau, Louisiana	Black Crappie	5	0.561	0.377	0.844	0.190
		Blue Catfish	7	0.217	0.167	0.367	0.068
		Bowfin	4	0.902	0.604	1.573	0.457
		Channel Catfish	6	0.178	0.001	0.732	0.278
		Freshwater Drum	4	0.860	0.617	1.264	0.289
		Largemouth Bass	9	0.995	0.312	1.883	0.558

SITE	SITE NAME	SPECIES	N	Mean	Min	Max	Std
		Smallmouth Buffalo	3	0.281	0.197	0.380	0.092
		White Crappie	12	0.434	0.158	0.914	0.260
0507	Bogue Chitto near Clifton, Louisiana	Blue Sucker	2	0.527	0.390	0.664	0.194
		Bluegill Sunfish	1	0.054	0.054	0.054	.
		Channel Catfish	4	0.261	0.053	0.745	0.325
		Flathead Catfish	1	0.359	0.359	0.359	.
		Largemouth Bass	5	0.908	0.441	1.612	0.507
		Rock Bass	2	0.494	0.370	0.617	0.175
		Spotted Bass	12	0.925	0.193	1.676	0.463
		White Crappie	1	0.254	0.254	0.254	.
0522	Vernon Lake south of Anacoco, Louisiana	Bluegill Sunfish	1	0.608	0.608	0.608	.
		Channel Catfish	12	0.282	0.176	0.547	0.100
		Flathead Catfish	1	0.513	0.513	0.513	.
		Largemouth Bass	22	0.616	0.001	1.150	0.281
		Redear Sunfish	7	0.559	0.158	0.950	0.290
0529	Toledo Bend Reservoir near Hunter, Louisiana	Black Crappie	4	0.251	0.001	0.433	0.207
		Blue Catfish	3	0.240	0.092	0.465	0.198
		Channel Catfish	3	0.049	0.001	0.146	0.084
		Flathead Catfish	1	0.644	0.644	0.644	.
		Freshwater Drum	4	0.502	0.001	0.859	0.368
		Largemouth Bass	20	0.565	0.001	1.156	0.309
		White Bass	2	0.515	0.481	0.549	0.048
		White Crappie	9	0.633	0.084	1.964	0.646
0531	Toledo Bend Reservoir near San Patrice, Louisiana	Black Crappie	4	0.294	0.022	0.755	0.341
		Bowfin	2	1.770	1.732	1.807	0.053
		Flathead Catfish	1	0.001	0.001	0.001	.
		Freshwater Drum	2	0.270	0.001	0.539	0.380
		Largemouth Bass	25	0.650	0.171	1.804	0.423
0538	Blind River near Gramercy, Louisiana	Black Crappie	3	0.193	0.001	0.366	0.183
		Blue Catfish	9	0.274	0.001	0.559	0.195
		Bluegill Sunfish	1	0.001	0.001	0.001	.
		Bowfin	10	0.810	0.236	1.692	0.407
		Channel Catfish	2	0.031	0.001	0.060	0.042
		Freshwater Drum	6	0.530	0.379	0.620	0.094
		Largemouth Bass	10	0.485	0.286	0.854	0.193
		Redear Sunfish	1	0.134	0.134	0.134	.
		Warmouth	1	0.320	0.320	0.320	.
		White Crappie	1	0.366	0.366	0.366	.
0539	Pearl River near Bogalusa, Louisiana	Black Crappie	3	0.432	0.351	0.553	0.107
		Channel Catfish	1	0.256	0.256	0.256	.
		Flathead Catfish	3	0.698	0.484	1.076	0.328
		Freshwater Drum	2	0.725	0.428	1.021	0.419
		Largemouth Bass	4	0.822	0.309	1.357	0.434
		Spotted Bass	1	0.842	0.842	0.842	.

SITE	SITE NAME	SPECIES	N	Mean	Min	Max	Std
		Striped Bass	1	0.345	0.345	0.345	.
		White Crappie	2	0.417	0.255	0.579	0.229
0544	Ouachita River near the State Line	Bigmouth Buffalo	3	0.568	0.473	0.655	0.091
		Black Crappie	2	0.891	0.622	1.160	0.380
		Blue Catfish	1	0.700	0.700	0.700	.
		Bluegill Sunfish	1	0.001	0.001	0.001	.
		Freshwater Drum	1	1.453	1.453	1.453	.
		Largemouth Bass	1	0.654	0.654	0.654	.
		Spotted Bass	3	0.709	0.446	1.017	0.288
		White Crappie	1	0.318	0.318	0.318	.
0567	Gulf of Mexico south-southwest of Grand Isle, Louisiana	King Mackerel	1	0.519	0.519	0.519	.
0568	Gulf of Mexico south-southeast of Grand Isle, Louisiana	King Mackerel	6	0.984	0.330	2.202	0.769
0569	Gulf of Mexico south of Grand Isle, Louisiana	King Mackerel	1	0.713	0.713	0.713	.
0603	Toledo Bend southwest of Logansport, Louisiana	Black Crappie	1	1.048	1.048	1.048	.
		Bowfin	3	1.068	0.893	1.206	0.160
		Largemouth Bass	4	0.829	0.682	1.117	0.201
		White Crappie	1	0.992	0.992	0.992	.
0634	Gulf of Mexico, Southwest Pass	King Mackerel	1	1.386	1.386	1.386	.
0643	Gulf of Mexico, ST-128	King Mackerel	2	0.633	0.439	0.826	0.274
0644	Gulf of Mexico, Sulphur Mine	Cobia	3	0.126	0.013	0.185	0.098
		Jack Crevalle	1	0.200	0.200	0.200	.
		Spanish Mackerel	1	0.214	0.214	0.214	.
0646	Gulf of Mexico, WD-41	Red Snapper	1	0.020	0.020	0.020	.
0719	Gulf of Mexico, WD-40	Lane Snapper	1	0.049	0.049	0.049	.
		Red Drum	3	0.142	0.045	0.305	0.142
0721	Gulf of Mexico, SS-45 near Isles Dernieres, Louisiana	Spotted Seatrout	2	0.043	0.033	0.052	0.013
0757	Seventh Ward Canal south of Kaplan, Louisiana	Black Crappie	4	0.470	0.347	0.700	0.166
		Blue Catfish	10	0.181	0.143	0.245	0.036
		Bowfin	1	0.753	0.753	0.753	.
		Carp	1	0.090	0.090	0.090	.
		Channel Catfish	1	0.165	0.165	0.165	.
		Flathead Catfish	2	0.306	0.205	0.407	0.143
		Freshwater Drum	1	0.593	0.593	0.593	.
		Largemouth Bass	1	0.272	0.272	0.272	.
		Smallmouth Buffalo	3	0.137	0.109	0.153	0.024
		White Crappie	10	0.331	0.166	0.522	0.093
0883	Phillips Lake northeast of Crossroads, Louisiana	Bigmouth Buffalo	3	0.829	0.474	1.123	0.329
		Black Crappie	2	0.999	0.949	1.048	0.070
		Bluegill Sunfish	1	0.460	0.460	0.460	.
		Bowfin	8	1.546	0.830	3.040	0.692

SITE	SITE NAME	SPECIES	N	Mean	Min	Max	Std
		Flathead Catfish	3	1.411	1.256	1.585	0.165
		Freshwater Drum	7	1.400	1.128	1.897	0.276
		Largemouth Bass	13	1.385	1.081	1.998	0.272
0911	Bayou Bartholomew at Hwy. 25	Bigmouth Buffalo	3	0.856	0.682	1.049	0.184
		Black Crappie	3	0.823	0.656	0.943	0.149
		Blue Catfish	1	0.254	0.254	0.254	.
		Bowfin	1	3.904	3.904	3.904	.
		Channel Catfish	3	0.470	0.274	0.608	0.174
		Flathead Catfish	1	0.855	0.855	0.855	.
		Freshwater Drum	6	1.130	0.906	1.535	0.247
		Largemouth Bass	1	0.898	0.898	0.898	.
		Smallmouth Buffalo	3	0.532	0.182	0.763	0.308
		Spotted Bass	3	1.055	0.824	1.385	0.293
		White Crappie	3	0.638	0.521	0.845	0.180
0914	Gulf of Mexico, south of Southwest Pass, Louisiana	King Mackerel	6	1.362	0.648	2.328	0.658
0964	Ivan Lake, Louisiana	Black Crappie	4	0.284	0.216	0.449	0.111
		Bowfin	4	1.733	1.129	2.216	0.498
		Largemouth Bass	10	0.679	0.370	1.179	0.245
		Redear Sunfish	1	0.121	0.121	0.121	.
0986	West Fork Calcasieu River, Louisiana	Bowfin	4	1.536	0.850	2.061	0.519
		Freshwater Drum	1	1.243	1.243	1.243	.
		Largemouth Bass	5	1.417	1.007	1.918	0.374
1011	Little River near Archie, upstream of Weir	Flathead Catfish	2	1.071	0.713	1.428	0.506
		Freshwater Drum	3	1.072	0.899	1.343	0.237
		Largemouth Buffalo	3	1.105	0.787	1.418	0.316
		White Crappie	3	0.451	0.344	0.529	0.096

Table 5.

Mean concentrations of mercury in fish (ppm) by site, for all species combined. Louisiana Department of Environmental Quality, Environmental Planning Division. 1994-December 2000.

SITE	SITE NAME	N	Mean	Min	Max	Std
0003	Mermentau River at Mermentau, Louisiana	28	0.230	0.044	0.754	0.171
0006	Bay Gardene (Bayou Lost) east of Pointe a la Hache	1	0.120	0.120	0.120	.
0013	Ouachita River at Sterlington, Louisiana	14	0.758	0.436	1.241	0.240
0033	Tangipahoa River west of Robert, Louisiana	13	0.465	0.014	1.223	0.387
0035	Pass Rigolets (The Rigolets) southeast of Slidell, Louisiana	16	0.536	0.157	1.190	0.306
0036	Pass Manchac at Manchac, Louisiana	14	0.179	0.033	0.486	0.139
0043	Amite River at Port Vincent, Louisiana	14	0.470	0.097	0.900	0.233
0062	Pearl River at Pools Bluff, Louisiana	14	0.319	0.046	0.884	0.258
0064	Bogue Chitto near Bush, Louisiana	60	0.560	0.054	1.341	0.381

SITE	SITE NAME	N	Mean	Min	Max	Std
0089	Little River southwest of Jena, Louisiana	19	0.867	0.077	2.438	0.663
0090	Black River at Jonesville, Louisiana	9	0.310	0.001	0.625	0.216
0091	Sabine River northeast of Orange, Texas	10	0.311	0.181	0.460	0.100
0093	Calcasieu River at Moss Bluff, Louisiana	26	0.350	0.033	0.995	0.268
0094	Bayou D'Inde near Lake Charles, Louisiana	2	0.669	0.540	0.797	0.182
0098	Bayou Lacassine near Lake Arthur, Louisiana	14	0.507	0.159	1.047	0.322
0125	Bayou Bonne Idee east of Mer Rouge, Louisiana	21	0.571	0.103	1.190	0.319
0131	English Bayou near Lake Charles, Louisiana	14	0.272	0.057	0.571	0.167
0134	Lake Providence at mid lake near Lake Providence, Louisiana	8	0.369	0.149	1.077	0.300
0141	Lake Bruin at Lake Bruin State Park, near St. Joseph, Louisiana	9	0.076	0.036	0.203	0.053
0144	Lake Verret at Attakapas Landing near Georgia, Louisiana	52	0.238	0.001	1.310	0.247
0156	Blind River northwest of Gramercy, Louisiana	10	0.359	0.159	0.671	0.193
0168	Bayou D'Inde SW of Westlake, Louisiana	6	0.249	0.050	0.512	0.193
0170	Bayou D'Inde WSW of Lake Charles, Louisiana	4	0.118	0.019	0.185	0.073
0174	Prien Lake near Lake Charles, Louisiana	10	0.114	0.000	0.449	0.137
0175	Lake Charles at Lake Charles, Louisiana	21	0.167	0.003	0.521	0.136
0181	Calcasieu River Coon Island Loop, west of Lake Charles, Louisiana	4	0.066	0.001	0.170	0.082
0182	Calcasieu River Coon Island Loop, near Westlake, Louisiana	2	0.832	0.780	0.884	0.074
0183	Calcasieu River Clooney Island Loop, west of Lake Charles, Louisiana	3	0.168	0.045	0.231	0.106
0184	Calcasieu River Clooney Island Loop, near Lake Charles, Louisiana	1	0.043	0.043	0.043	.
0187	Calcasieu River at mile 27.61, near Lake Charles, Louisiana	4	0.112	0.001	0.281	0.119
0190	Calcasieu Lake West Pass near Grand Lake, Louisiana	4	0.109	0.049	0.191	0.067
0206	Lake Pontchartrain-07 near New Orleans, Louisiana	4	0.225	0.093	0.436	0.155
0237	Amite River Diversion Canal NE of Sorrento, Louisiana	19	0.481	0.095	1.380	0.290
0263	Amite River south of Springfield, Louisiana	12	0.552	0.283	1.090	0.281
0265	Pass Manchac east of Manchac, Louisiana	11	0.270	0.141	0.587	0.129
0281	Clear Lake north of Mansfield, Louisiana	11	0.082	0.008	0.311	0.090
0294	Bayou Lafourche at Lockport, Louisiana	15	0.125	0.011	0.461	0.131
0298	Natalbany River west of Ponchatoula, Louisiana	26	0.710	0.199	1.487	0.352
0301	Bayou Bonfouca at Slidell, Louisiana	7	0.206	0.154	0.269	0.037
0305	Bayou Saint John at New Orleans, Louisiana	7	0.072	0.001	0.174	0.061
0308	Bayou Des Cannes northeast of Jennings, Louisiana	47	0.432	0.001	1.176	0.329
0310	White lake southwest of Abbeville, Louisiana	14	0.088	0.000	0.338	0.090
0312	Lake Chicot north of Ville Platte, Louisiana	17	0.709	0.209	1.494	0.362
0313	Lake Fausse Pointe east of New Iberia, Louisiana	55	0.314	0.042	0.891	0.234
0326	Lake D'Arbonne at Farmerville, Louisiana	21	0.213	0.001	1.522	0.323
0333	Cane River at Natchitoches, Louisiana	23	0.077	0.012	0.241	0.058

SITE	SITE NAME	N	Mean	Min	Max	Std
0335	False River south of New Roads, Louisiana	11	0.064	0.032	0.115	0.029
0338	Lake Palourde near Morgan City, Louisiana	37	0.354	0.006	0.936	0.250
0351	Caillou Lake south of Houma, Louisiana	6	0.014	0.001	0.076	0.031
0353	Bayou Desiard north of Monroe, Louisiana	8	0.205	0.028	0.505	0.210
0361	Lake Saint Joseph southeast of Newellton, Louisiana	11	0.127	0.025	0.243	0.083
0362	Bayou Macon Cutoff #2 east of Winnsboro, Louisiana	9	0.225	0.108	0.499	0.129
0366	Black Lake north of Natchitoches, Louisiana	38	0.652	0.143	2.278	0.466
0367	Lake Saint John northeast of Ferriday, Louisiana	22	0.095	0.001	0.296	0.080
0372	Turkey Creek Lake south of Winnsboro, Louisiana	7	0.280	0.171	0.423	0.093
0374	Toledo Bend Reservoir south of Zwolle, Louisiana	26	0.294	0.040	0.766	0.176
0375	Iatt Lake northeast of Colfax, Louisiana	13	0.516	0.148	1.260	0.296
0376	Saline Bayou north of Marksville, Louisiana	11	0.391	0.092	1.078	0.361
0377	Pearl River near Bogalusa, Louisiana	19	0.329	0.036	1.004	0.277
0378	Cocodrie Lake east of Glenmora, Louisiana	10	0.292	0.083	0.538	0.146
0379	Lake Chicot south of St. Landry, Louisiana	60	0.543	0.041	1.419	0.318
0381	Bundick Lake southeast of DeRidder, Louisiana	24	0.243	0.038	0.954	0.189
0388	Bayou Courtableau east of Port Barre, Louisiana	40	0.276	0.031	0.728	0.164
0397	Bayou Bonfouca	11	0.491	0.078	0.674	0.170
0404	Spanish Lake south of New Orleans, Louisiana	6	0.228	0.099	0.476	0.129
0405	Lost Lake near Delacroix, Louisiana	1	0.241	0.241	0.241	.
0409	Tchefuncte River near Covington, Louisiana	21	0.357	0.001	0.972	0.296
0411	Bogue Falaya at Covington, Louisiana	20	0.412	0.060	1.152	0.309
0416	Bayou D'Arbonne Lake at Farmerville, Louisiana	11	0.266	0.111	0.618	0.140
0419	Bayou Lacombe north of Lacombe, Louisiana	16	0.462	0.001	1.354	0.436
0421	Bayou Lacombe south of Lacombe, Louisiana	13	0.234	0.067	0.521	0.137
0424	Bayou D'Arbonne near Hollands Bluff, Louisiana	7	0.869	0.336	1.484	0.380
0427	Tickfaw River east of Killian, Louisiana	25	0.455	0.001	1.737	0.426
0432	Cross Lake near Shreveport, Louisiana	18	0.255	0.062	0.780	0.208
0435	Amite River southeast of Port Vincent, Louisiana	11	0.129	0.073	0.284	0.074
0436	Lake Henderson, east of Henderson, Louisiana	183	0.473	0.001	1.243	0.254
0437	West Fork Calcasieu River north of Westlake, Louisiana	11	0.284	0.051	0.753	0.204
0438	Bayou Nezpique northeast of Jennings, Louisiana	26	0.366	0.099	1.033	0.195
0439	Lake Boeuf north of Raceland, Louisiana	26	0.083	0.001	0.537	0.126
0440	Flat Lake north of Morgan City, Louisiana	24	0.183	0.049	0.380	0.109
0441	Grand Lake northeast of Franklin, Louisiana	9	0.114	0.018	0.210	0.071
0442	Bayou Sale south of Franklin, Louisiana	27	0.153	0.001	0.615	0.157
0443	Orange Grove Canal west of Houma, Louisiana	24	0.084	0.001	0.331	0.074
0444	Fohs Canal southwest of Dulac, Louisiana	9	0.072	0.016	0.128	0.036
0445	Sixmile Creek southeast of Grant, Louisiana	3	0.186	0.141	0.235	0.047
0458	Bayou Bartholomew northeast of Bastrop, Louisiana	12	0.881	0.509	1.317	0.211
0467	Tangipahoa River west of Madisonville, Louisiana	11	0.258	0.087	0.517	0.123
0468	Pear River (West) east of Slidell, Louisiana	27	0.715	0.039	2.815	0.673
0469	Beau Bayou east of St. Martinville, Louisiana	6	0.081	0.019	0.182	0.059
0470	Big Bayou Pigeon southwest of Pigeon, Louisiana	9	0.063	0.022	0.097	0.024

SITE	SITE NAME	N	Mean	Min	Max	Std
0471	Toledo Bend Reservoir south of Logansport, Louisiana	46	0.316	0.001	1.202	0.291
0473	Cheneire Brake west of Monroe, Louisiana	14	0.186	0.001	0.456	0.192
0474	Caddo Lake (James Bayou) west of Oil City, Louisiana	4	0.167	0.131	0.264	0.065
0475	Caddo Lake northeast of Mooringsport, Louisiana	1	0.136	0.136	0.136	.
0476	Caddo Lake at Mooringsport, Louisiana	2	0.162	0.004	0.320	0.223
0479	Caddo Lake south of Oil City, Louisiana	14	0.123	0.001	0.484	0.164
0480	Caddo Lake west-southwest of Oil City, Louisiana	31	0.276	0.072	0.711	0.184
0481	Caddo Lake (James Bayou) northwest of Oil City, Louisiana	3	0.489	0.437	0.556	0.061
0482	Cow Island Lake east of Butte La Rose, Louisiana	17	0.150	0.019	0.402	0.093
0483	Bayou Benoit east of Loreauville, Louisiana	25	0.292	0.070	0.676	0.134
0501	Anacoco Lake west of Leesville, Louisiana	19	0.490	0.173	0.939	0.235
0502	Bay Wallace south of Gibson, Louisiana	10	0.104	0.001	0.293	0.130
0503	Bayou Liberty near Slidell, Louisiana	29	0.582	0.000	1.528	0.405
0504	Bayou Plaquemine Brule near Mermentau, Louisiana	50	0.549	0.001	1.883	0.437
0505	Bayou Teche at New Iberia, Louisiana	20	0.252	0.038	0.542	0.135
0506	Big Alabama southeast of Krotz Springs, Louisiana	39	0.540	0.140	1.544	0.326
0507	Bogue Chitto near Clifton, Louisiana	28	0.693	0.053	1.676	0.481
0508	Bayou Teche at Patterson, Louisiana	27	0.192	0.001	0.492	0.127
0509	Breton Sound near Shell Beach, Louisiana	9	0.432	0.221	0.689	0.137
0510	Cotile Lake southwest of Boyce, Louisiana	17	0.228	0.043	0.565	0.115
0511	City Park Lake at New Orleans, Louisiana	30	0.355	0.007	1.257	0.290
0512	Kincaid Lake west of Alexandria, Louisiana	25	0.252	0.001	1.204	0.241
0513	Lake de Cade west of Dulac, Louisiana	10	0.392	0.140	0.838	0.224
0514	Lake Martin near Parks, Louisiana	14	0.087	0.001	0.265	0.077
0515	Miller's Lake northwest of Ville Platte, Louisiana	21	0.304	0.001	0.955	0.332
0516	Old River north of Morganza, Louisiana	10	0.140	0.001	0.368	0.127
0517	Seventh Ward Canal southwest of Abbeville, Louisiana	38	0.524	0.001	1.588	0.387
0518	Sibley Lake west of Natchitoches, Louisiana	17	0.261	0.007	0.791	0.242
0519	Spring Bayou near Marksville, Louisiana	51	0.417	0.072	1.276	0.255
0520	Union Oil Canal System southwest of Houma, Louisiana	10	0.335	0.021	0.869	0.262
0521	Vermilion River at Lafayette, Louisiana	46	0.303	0.001	0.927	0.258
0522	Vernon Lake south of Anacoco, Louisiana	43	0.511	0.001	1.150	0.275
0528	City Park Lake at Disposal Area at New Orleans, Louisiana	7	0.199	0.066	0.408	0.127
0529	Toledo Bend Reservoir near Hunter, Louisiana	46	0.490	0.001	1.964	0.397
0530	Toledo Bend Reservoir near Converse, Louisiana	21	0.221	0.063	0.442	0.105
0531	Toledo Bend Reservoir near San Patrice, Louisiana	34	0.632	0.001	1.807	0.508
0532	Toledo Bend Reservoir southwest of Zwolle, Louisiana	6	0.336	0.208	0.527	0.126
0533	City Park Lake at Children's Rodeo at New Orleans, Louisiana	8	0.161	0.056	0.316	0.095

SITE	SITE NAME	N	Mean	Min	Max	Std
0534	Toledo Bend Reservoir near Negreet, Louisiana	16	0.430	0.215	0.695	0.157
0535	Toledo Bend Reservoir near Toro, Louisiana	16	0.335	0.057	0.564	0.143
0536	False River	18	0.248	0.110	0.380	0.086
0537	Toledo Bend near WLF Fish Hatchery	10	0.182	0.001	1.256	0.381
0538	Blind River near Gramercy, Louisiana	44	0.456	0.001	1.692	0.332
0539	Pearl River near Bogalusa, Louisiana	17	0.612	0.255	1.357	0.324
0540	Tensas River at Cooter Point	21	0.369	0.036	0.747	0.208
0541	Lac des Allemands	25	0.216	0.000	0.596	0.169
0542	Mystic Crew Bayou	21	0.334	0.051	0.704	0.172
0543	Ouachita River near Columbia, Louisiana	9	0.430	0.001	1.560	0.476
0544	Ouachita River near State Line	13	0.672	0.001	1.453	0.370
0545	Pearl River Diversion Canal	16	0.571	0.001	1.274	0.397
0546	Breton Sound near blk 25, Louisiana	1	0.776	0.776	0.776	.
0558	Lake Salvador	11	0.192	0.001	0.686	0.199
0559	Red River at Alexandria, Louisiana	11	0.301	0.104	0.657	0.146
0560	Caddo Lake at Mooringsport, Louisiana	24	0.189	0.001	0.620	0.182
0561	Lake Pelto	8	0.057	0.001	0.142	0.062
0562	Lake Pelto/Lost Lake	3	0.081	0.001	0.122	0.070
0563	Timbalier Bay, Louisiana	3	0.267	0.160	0.428	0.142
0564	Lake Barre	4	0.236	0.001	0.679	0.303
0565	Little Lake	6	0.082	0.001	0.146	0.065
0566	Catfish Lake west of Golden Meadow, Louisiana	10	0.059	0.001	0.146	0.056
0567	Gulf of Mexico south-southwest of Grand Isle, Louisiana	1	0.519	0.519	0.519	.
0568	Gulf of Mexico south-southeast of Grand Isle, Louisiana	6	0.984	0.330	2.202	0.769
0569	Gulf of Mexico south of Grand Isle, Louisiana	1	0.713	0.713	0.713	.
0576	Vermilion River near Lafayette, Louisiana	2	0.175	0.001	0.348	0.245
0578	Bayou Petite Anse east of Delcambre, Louisiana	27	0.265	0.067	0.678	0.160
0579	Bird Island Bayou at Marsh Island	12	0.010	0.000	0.051	0.015
0580	Bayou Queue de Tortue west of Kaplan, Louisiana	7	0.194	0.045	0.321	0.116
0581	Black Bayou Lake at Hosston, Louisiana	11	0.339	0.078	1.124	0.299
0582	Bogue Chitto River southeast of Sun, Louisiana	14	0.564	0.268	0.865	0.206
0583	Capitol Lake at Baton Rouge, Louisiana	5	0.172	0.138	0.192	0.022
0584	Clear Lake southeast of Bossier City, Louisiana	8	0.174	0.030	0.523	0.160
0585	Crooked Creek Reservoir southwest of Turkey Creek, Louisiana	39	0.570	0.164	1.109	0.229
0586	Cypress Bayou Reservoir east of Benton, Louisiana	8	0.151	0.021	0.264	0.087
0587	Grand Bayou Reservoir near Coushatta, Louisiana	48	0.627	0.000	1.888	0.477
0588	Grassy Lake southwest of Napoleonville, Louisiana	23	0.348	0.039	0.738	0.211
0589	Indian Creek Reservoir west of Lecompte, Louisiana	20	0.454	0.177	1.400	0.259
0590	Kepler Lake north of Castor, Louisiana	9	0.261	0.002	0.799	0.263
0591	Lacassine Pools southwest of Lake Arthur, Louisiana	11	0.158	0.036	0.410	0.112
0592	Lake Bistineau west of Ringold, Louisiana	11	0.140	0.003	0.632	0.186
0593	Lake Buhlow at Pineville, Louisiana	18	0.320	0.018	0.722	0.237

SITE	SITE NAME	N	Mean	Min	Max	Std
0594	Lake Dauterive northeast of Loreauville, Louisiana	49	0.386	0.103	0.990	0.215
0595	Lake Peigneur at Jefferson Island, Louisiana	10	0.116	0.002	0.353	0.138
0596	Lake Pontchartrain south of Bayou Lacombe	12	0.461	0.043	1.113	0.424
0597	Lake Rodemacher west of Boyce, Louisiana	16	0.282	0.055	0.531	0.154
0598	Lake Salvador south of Westwego, Louisiana	24	0.492	0.056	1.098	0.342
0599	Mill Creek Reservoir near Saline, Louisiana	15	0.301	0.001	0.839	0.270
0600	Oyster Lake at Marsh Island, Louisiana	12	0.014	0.001	0.038	0.013
0601	Sabine Wildlife Refuge Canals north of Johnson Bayou, Louisiana	14	0.221	0.094	0.473	0.120
0602	Sweet Lake northeast of Cameron, Louisiana	15	0.211	0.074	0.378	0.097
0603	Toledo Bend southwest of Logansport, Louisiana	9	0.951	0.682	1.206	0.189
0604	Toledo Bend west of Zwolle, Louisiana	8	0.848	0.502	1.017	0.170
0605	Vermilion River south of Abbeville, Louisiana	24	0.513	0.017	1.329	0.318
0606	Willow Lake northeast of Cameron, Louisiana	16	0.070	0.000	0.215	0.077
0608	West Retention Levee Borrow Pit Canal	5	0.027	0.009	0.042	0.012
0609	Bayou Choctaw near I-10 east of Gross Tete, Louisiana	21	0.167	0.018	0.369	0.108
0610	Bayou Choctaw near Indian Village, Louisiana	8	0.167	0.004	0.393	0.136
0611	Bayou Gravenberg	7	0.189	0.031	0.548	0.174
0612	Black Bayou Reservoir near Benton, Louisiana	7	0.349	0.106	0.991	0.296
0613	Buffalo Cove	3	0.105	0.097	0.116	0.010
0614	Clear Lake east of Campti, Louisiana	6	0.368	0.218	0.667	0.166
0615	Intracoastal Waterway near Bourg, Louisiana	33	0.132	0.020	0.248	0.057
0617	Lake Arthur	30	0.321	0.019	0.761	0.195
0618	Lake Dubisson near Dubisson, Louisiana	20	0.282	0.026	0.663	0.157
0622	Saline Bayou west of Calvin, Louisiana	19	0.543	0.158	1.318	0.313
0624	Vermilion River near Abbeville, Louisiana	13	0.258	0.043	0.697	0.182
0625	Bayou Cocodrie north of Washington, Louisiana	14	0.214	0.008	0.639	0.181
0626	Bayou Desiard southeast of Sterlington, Louisiana	17	0.532	0.043	1.058	0.334
0627	Calcasieu River north of Lake Charles, Louisiana	2	0.163	0.157	0.169	0.008
0628	Calcasieu River Clooney Island Loop near Westlake, Louisiana	2	0.055	0.007	0.102	0.067
0629	Catahoula Lake at Catahoula, Louisiana	20	0.169	0.032	0.373	0.089
0630	City Park Lake at Baton Rouge, Louisiana	7	0.074	0.027	0.107	0.032
0631	Contraband Bayou at Lake Charles, Louisiana	3	0.033	0.002	0.066	0.032
0632	Franklin Canal southeast of Franklin, Louisiana	14	0.111	0.023	0.284	0.074
0633	Garden City Oilfield Canals south of Franklin, Louisiana	17	0.192	0.021	1.066	0.257
0634	Gulf of Mexico, Southwest Pass	1	1.386	1.386	1.386	.
0635	Barataria Bay north Grand Isle, Louisiana	5	0.143	0.030	0.224	0.075
0636	Lake Cataouatche south of Avondale, Louisiana	10	0.184	0.107	0.283	0.059
0637	Lake Pontchartrain near Mandeville, Louisiana	9	0.161	0.040	0.275	0.074
0638	Lake Pontchartrain south of Madisonville, Louisiana	14	0.319	0.065	1.271	0.317
0639	Lake Salvador south of Avondale, Louisiana	15	0.108	0.006	0.306	0.102
0640	North Pass south of Ponchatoula, Louisiana	14	0.332	0.068	1.186	0.317

SITE	SITE NAME	N	Mean	Min	Max	Std
0642	Spanish Lake near New Iberia, Louisiana	46	0.051	0.000	0.178	0.041
0643	Gulf of Mexico, ST-128	2	0.633	0.439	0.826	0.274
0644	Gulf of Mexico, Sulphur Mine	5	0.159	0.013	0.214	0.082
0645	University Lake in Baton Rouge, Louisiana	8	0.062	0.046	0.082	0.013
0646	Gulf of Mexico, WD-41	1	0.020	0.020	0.020	.
0694	Intracoastal Waterway south of Avery Island, Louisiana	12	0.168	0.073	0.346	0.074
0698	Atchafalaya Basin near Crewboat Chute, Louisiana	4	0.015	0.010	0.023	0.006
0699	Beckwith Creek southeast of Deq	11	0.433	0.124	0.735	0.228
0700	Big Saline Bayou East of Deville, Louisiana	40	0.669	0.080	2.464	0.556
0701	Cocodrie Lake Southwest of Vidalia, Louisiana	18	0.114	0.012	0.284	0.076
0702	Grand Isle Beach at Gulf of Mexico	1	0.491	0.491	0.491	.
0703	Gulf of Mexico, Tete-Butte Reef	8	0.104	0.022	0.244	0.070
0704	Hickory Creek southeast of DeQuincy, Louisiana	11	0.410	0.102	0.741	0.195
0705	Houston River northwest of Sulphur, Louisiana	13	0.589	0.204	2.015	0.539
0706	Bayou Lacassine near Hayes, Louisiana	15	0.449	0.077	1.441	0.357
0707	Lake Concordia near Ferriday, Louisiana	11	0.050	0.000	0.305	0.089
0708	Lake Michael, Marsh Island	2	0.069	0.040	0.097	0.040
0709	Lake Pontchartrain at Bonne Carre Spillway	19	0.102	0.021	0.280	0.070
0710	Lake Pontchartrain at South Causeway Bridge	15	0.046	0.000	0.312	0.079
0711	Larto Lake northeast of Marksville, Louisiana	14	0.272	0.048	0.641	0.195
0712	Nantachie lake southeast of Montgomery, Louisiana	13	0.048	0.000	0.257	0.084
0713	Old River near Niblett Bluff, Louisiana	13	0.450	0.045	1.033	0.256
0714	Vermilion Bay at Redfish Point, Louisiana	5	0.183	0.032	0.490	0.199
0715	Sabine River northwest of Merryville, Louisiana	16	0.266	0.119	0.461	0.104
0716	Saline Lake southwest of Calvin, Louisiana	12	0.535	0.123	1.675	0.421
0717	South Point, Marsh Island	6	0.091	0.037	0.308	0.107
0718	Bay Antoine south of Houma, Louisiana	2	0.048	0.043	0.052	0.006
0719	Gulf of Mexico, WD-40	4	0.119	0.045	0.305	0.125
0720	Lake Tambour southeast of Chauvin, Louisiana	2	0.056	0.050	0.062	0.008
0721	Gulf of Mexico, SS-45 near Isles Dernieres, Louisiana	2	0.043	0.033	0.052	0.013
0722	Lake Pelto near Isles Dernieres, Louisiana	3	0.051	0.032	0.090	0.033
0723	Taylor's Bayou near Caillou Bay	5	0.082	0.016	0.115	0.045
0724	Wonder Lake southeast of Chauvin, Louisiana	3	0.114	0.010	0.283	0.148
0725	Lake Cuatro Caballo (4 Horse Lake)	6	0.086	0.045	0.133	0.032
0726	Bayou Long near Stephenville, Louisiana	14	0.202	0.067	0.633	0.142
0727	Caminada Bay north of Cheniere Caminada	1	1.243	1.243	1.243	.
0728	Devil's Bay	3	0.040	0.033	0.048	0.008
0729	Devil's Bay Little Lake at Fisherman's Point, Louisiana	2	0.011	0.003	0.018	0.011
0730	Lake Fields near Lockport, Louisiana	15	0.087	0.014	0.238	0.066
0731	Breton Sound at Pelican Point	4	0.168	0.048	0.277	0.096
0732	Caillou Bay near Raccoon Point (Isles Deneires)	1	0.063	0.063	0.063	.
0733	Cote Blanche Bay near Lake Point (Marsh Island)	2	0.049	0.004	0.093	0.063
0734	Upper Grand River near Cow Island	10	0.133	0.054	0.224	0.054
0735	Boeuf River west of Alto, Louisiana	15	0.062	0.000	0.234	0.066

SITE	SITE NAME	N	Mean	Min	Max	Std
0736	Chatham Lake near Chatham, Louisiana	7	0.228	0.043	0.459	0.156
0737	Grand Lake near Hackberry Point, Louisiana	10	0.186	0.059	0.600	0.162
0738	Lake Lafourche north of Rayville, Louisiana	13	0.121	0.055	0.349	0.088
0739	Lake Misere near Bayou Misere	12	0.429	0.058	1.330	0.375
0740	Ponchatoula River near Ponchatoula, Louisiana	11	0.526	0.074	1.100	0.336
0741	Spanish Lake near Baton Rouge, Louisiana	8	0.188	0.054	0.474	0.150
0742	Woolen Lake	8	0.254	0.053	0.558	0.216
0743	Little Atchafalaya River near Cow Island	4	0.266	0.191	0.356	0.071
0744	Turner's Bay (Calcasieu Lake)	2	0.002	0.000	0.003	0.002
0745	Bayou Boue east of Pointe a la Hache	2	0.099	0.088	0.110	0.016
0746	Bunchs Cutoff (Rock Pile)	11	0.422	0.304	0.766	0.131
0747	Crew Boat Chute northeast of Grand Isle	14	0.165	0.058	0.315	0.079
0748	Gulf of Mexico, Diamond Reef	3	0.226	0.089	0.456	0.200
0749	Gulf of Mexico, South Marsh Island, Block 6	7	0.652	0.442	0.953	0.164
0750	Gulf of Mexico, West Cameron Block 110	7	0.621	0.112	1.685	0.728
0751	Gulf of Mexico, West Cameron Block 170	9	0.589	0.183	1.183	0.351
0752	Gulf of Mexico, West Delta Block 93E	1	0.078	0.078	0.078	.
0753	Intracoastal Waterway, west of Vermilion Lock	6	0.175	0.094	0.269	0.065
0754	Lake Bartholomew east of Sterlington	9	0.209	0.069	0.321	0.098
0755	Millers Chute east of Grand Lake	11	0.333	0.243	0.475	0.079
0756	North Prong of Schooner Bay	4	0.222	0.080	0.360	0.116
0757	Seventh Ward Canal south of Kaplan, Louisiana	34	0.291	0.090	0.753	0.164
0758	Six Mile Lake, Atchafalaya Basin	14	0.117	0.051	0.283	0.056
0759	Two O'Clock Bayou, west of Krotz Springs, Louisiana	14	0.289	0.092	0.573	0.147
0760	West Cote Blanche Bay, Hammock Bulkhead	1	0.097	0.097	0.097	.
0770	Ouachita River at Columbia Lock and Dam near Riverton, Louisiana	8	0.655	0.328	1.071	0.251
0774	Lake Louis west of Sicily Island, Louisiana	11	0.298	0.133	0.749	0.175
0783	Corney Lake at Spillway	21	0.571	0.124	1.571	0.330
0788	Cheniere Brake Lake south of West Monroe, Louisiana	30	0.475	0.073	2.149	0.414
0849	Bayou Choupique at Carlyss, Louisiana	14	0.259	0.061	0.619	0.173
0852	Calcasieu River Coastal Waters southeast of Cameron Jettison	6	0.101	0.068	0.140	0.026
0853	Bayou Segnette south of Westwego, Louisiana	7	0.148	0.033	0.270	0.083
0854	Vermilion Bay at Blue Point	1	0.079	0.079	0.079	.
0855	Caney Lake north of Minden, Louisiana	17	0.420	0.121	1.305	0.350
0856	Harvey Canal southwest of Belle Chase, Louisiana	9	0.117	0.060	0.189	0.043
0857	Intracoastal Waterway at Forked Island, Louisiana	6	0.137	0.077	0.199	0.040
0858	Red River south of Elm Grove, Louisiana	15	0.164	0.081	0.568	0.121
0859	West Lake Verret near Intracoastal Waterway	15	0.278	0.062	0.550	0.148
0860	Gulf of Mexico at Grand Isle Beach	1	0.438	0.438	0.438	.
0861	Intracoastal Waterway near Belle Chasse, Louisiana	11	0.105	0.025	0.428	0.111
0862	Mississippi River southwest of St. Francisville, Louisiana	15	0.186	0.098	0.319	0.060

SITE	SITE NAME	N	Mean	Min	Max	Std
0863	Mississippi River at Marengo Bend	10	0.290	0.163	0.421	0.098
0864	Second Bay	1	0.123	0.123	0.123	.
0865	Mississippi River at Caernarvon, Louisiana	1	0.165	0.165	0.165	.
0866	Blue Hammock Bayou	5	0.102	0.063	0.137	0.028
0867	Bayou Rambio	2	0.129	0.058	0.199	0.100
0868	Lake Pontchartrain near Railroad Bridge	3	0.225	0.148	0.280	0.069
0869	Lake Hatch southwest of Crozier, Louisiana	12	0.066	0.018	0.165	0.042
0870	Bayou Teche near Franklin, Louisiana	14	0.116	0.038	0.275	0.076
0871	Lake Theriot southwest of Crozier, Louisiana	18	0.090	0.032	0.191	0.051
0873	Bayou Pointe Aux Chiens, east of Montegut, Louisiana	1	0.201	0.201	0.201	.
0874	Bayou Queue de Tortue near confluence with Mermentau River	13	0.691	0.170	1.670	0.620
0875	Calcasieu River near Kinder pumping station	13	0.567	0.090	1.068	0.322
0876	Calcasieu Lake at Nine Mile Cutoff	3	0.174	0.101	0.244	0.072
0877	Gulf of Mexico, West Cameron Block 140	5	0.224	0.041	0.810	0.331
0878	Gulf of Mexico, West Delta Block 21	3	0.178	0.098	0.289	0.099
0879	Louisiana	12	0.997	0.266	1.887	0.481
0880	Intracoastal Waterway at Warren Canal	7	0.223	0.114	0.368	0.103
0881	Warren Canal near Intracoastal Waterway	21	0.265	0.095	0.993	0.222
0882	Lake Claiborne southwest of Lisbon, Louisiana	5	0.331	0.189	0.498	0.140
0883	Phillips Lake northeast of Crossroads, Louisiana	37	1.334	0.460	3.040	0.446
0894	Upper Grand River west of Bayou Pigeon, Louisiana	11	0.227	0.097	0.710	0.189
0895	Little Tensas Bayou	12	0.308	0.092	0.852	0.201
0896	Lake Penchant southwest of Houma, Louisiana	13	0.109	0.014	0.268	0.072
0911	Bayou Bartholomew at Hwy. 425	28	0.922	0.182	3.904	0.664
0912	Bayou Cowan, Louisiana	14	0.411	0.130	0.877	0.192
0913	Bayou des Cannes	13	0.499	0.147	1.136	0.293
0914	Gulf of Mexico south of Southwest Pass, Louisiana	6	1.362	0.648	2.328	0.658
0915	Little Bayou Pigeon, Louisiana	11	0.447	0.177	0.606	0.134
0916	Mississippi River, 3 miles south of Grand Pass, Louisiana	6	0.130	0.046	0.216	0.069
0917	Mississippi River 3 miles southeast of Venice, Louisiana	5	0.158	0.045	0.266	0.079
0963	Cane River near Melrose, Louisiana	13	0.254	0.051	0.827	0.213
0964	Ivan Lake, Louisiana	19	0.788	0.121	2.216	0.600
0965	Lake Bistineau, Louisiana	9	0.597	0.309	1.084	0.273
0966	Red River at Natchitoches, Louisiana	9	0.284	0.121	0.548	0.147
0967	Wallace Lake, Louisiana	11	0.656	0.227	1.525	0.364
0981	Bayou Bristow, Work Canal, south of I-10, Louisiana	16	0.698	0.309	1.220	0.270
0982	Bayou Bristow, Work Canal, southeast of Des Glaise, Louisiana	11	0.694	0.417	0.924	0.186
0983	Bayou Plaquemine, Louisiana	13	0.230	0.071	0.552	0.172
0984	I-10 Canal, East Atchafalaya Basin, Louisiana	25	0.513	0.165	0.971	0.223
0985	Raccourci Old River, Louisiana	12	0.303	0.137	0.499	0.116
0986	West Fork Calcasieu River, Louisiana	10	1.447	0.850	2.061	0.401

SITE	SITE NAME	N	Mean	Min	Max	Std
0996	Blood River northwest of Warsaw Landing	8	0.789	0.301	1.799	0.465
0997	Finch Lake west of Ouachita River	16	0.765	0.050	1.949	0.546
0998	Upper Grand River at levee	30	0.375	0.041	0.890	0.217
0999	Saline Lake southeast of Deville, Louisiana	24	0.339	0.028	1.151	0.307
1000	Black River near Jonesville, Louisiana	15	0.501	0.160	1.181	0.324
1001	Bushley Bayou south-southwest of Harrisonburg, Louisiana	23	0.403	0.047	0.983	0.221
1002	Bussey Brake southwest of Wardville, Louisiana	10	0.127	0.061	0.285	0.069
1003	Hilliards Coupe south-southeast of Hebert, Louisiana	13	0.149	0.055	0.403	0.094
1004	Morengo Lake northwest of Mason, Louisiana	11	0.221	0.082	0.340	0.089
1005	Tew Lake near Wallace Ridge, Louisiana	20	0.449	0.111	1.664	0.419
1006	Toledo Bend Reservoir southwest of Zwolle, Louisiana	11	0.423	0.115	1.558	0.405
1007	Wallace Lake near Quaid, Louisiana	25	0.446	0.116	1.172	0.267
1008	Bayou Queue de Tortue north of Leleux, Louisiana	13	0.329	0.161	0.604	0.139
1009	Lake Plain Dealing near Plain Dealing, Louisiana	7	0.473	0.157	1.344	0.419
1010	Little River near Jonesville, Louisiana	16	0.576	0.210	1.177	0.293
1011	Little River near Archie-upstream of Weir	11	0.911	0.344	1.428	0.383
1012	Beau Bayou near intersection with Bayou La Rose, Louisiana	16	0.432	0.121	0.672	0.163
1013	Eagle Lake near Peelers, Louisiana	11	0.080	0.029	0.144	0.040
1023	Gulf of Mexico near ERC Rig-EC38A, Louisiana	1	1.018	1.018	1.018	.
1024	Bayou Macon near Delhi, Louisiana	12	0.253	0.091	0.614	0.145
1025	Moon Lake, Louisiana	12	0.779	0.271	1.642	0.433
1026	Wall Lake, Louisiana	9	0.917	0.382	2.811	0.770
1027	Breton Sound, Block 11, Louisiana	2	0.296	0.288	0.304	0.011
1028	Lac Des Allemands, Louisiana	17	0.169	0.042	0.651	0.167
1029	Gulf of Mexico, West Cameron 181, Louisiana	5	0.814	0.438	1.322	0.353
1030	Bayou Tortue, Louisiana	9	0.606	0.123	1.010	0.254
1031	Bayou des Cannes, Louisiana	11	0.563	0.119	1.761	0.596
1032	Bayou Plaquemine Brule, Louisiana	13	0.493	0.089	1.528	0.445
1033	Bayou Petite Prairie, Louisiana	13	0.383	0.087	1.094	0.262
1034	Bayou Teche near New Iberia, Louisiana	15	0.202	0.071	0.709	0.162
1035	Bayou Teche near Patterson, Louisiana	13	0.213	0.024	0.758	0.212
1036	Lake Palourde	15	0.309	0.026	1.205	0.381
1113	Bayou Choctaw north of confluence with Bayou Grosse Tete, Louisiana	12	0.302	0.056	0.939	0.263
1114	Bayou Chene near Verret, Louisiana	13	0.662	0.149	2.727	0.765

Sediment, Epiphyte and Water Analysis Results

Tables 7 and 8 are summaries of sediment and epiphyte data, respectively, for those sites that are currently under advisory. There are currently no regulatory criteria for acceptable concentrations of mercury in sediments. However, sediment guidelines are available for screening purposes only. The two most frequently used values are the effects range-low (ER-L)

and effects range-median (ER-M). For mercury these are 0.15 ppm and 0.71 ppm, respectively (EPA, 1997). A second set of screening values are the apparent effects threshold-low (AET-L) and the apparent effects threshold-high (AET-H). These are 0.59 ppm and 0.71 ppm, respectively (EPA, 1997). There are no screening values or regulatory criteria for mercury in epiphytes. Sediment grain size analyses and loss on ignition analyses are reported in Appendix C. Epiphyte samples were collected in an effort to correlate epiphyte concentrations to water, sediment or tissue concentrations. No correlations have been observed; however, the number of epiphyte samples is very limited, thus making correlation analysis difficult.

Five hundred and sixteen water samples, including all total mercury and dissolved mercury samples, were taken between 1994 and December, 2000. Mercury was detected in seventy of the water samples, and rarely exceeded 0.1 ppb in concentration. The maximum water concentration was 0.72 ppb at site number 0374 (Toledo Bend near Zwolle). By comparison, the current Louisiana water quality freshwater acute criteria for mercury is 2.04 ppb, and the freshwater chronic criteria is 0.012 ppb. The drinking water supply criteria 2.0 ppb mercury. LDEQ's ambient water quality sampling program, which is separate from the mercury study described here, has noted several water bodies where metals analysis has found similar criteria exceedences. However, it is now believed that these elevated concentrations may be the result of sample and laboratory contamination, not ambient water quality problems. This metals problem is being investigated using new EPA clean techniques for sampling and analysis of metals. Detailed results for water sampling can be found in Appendix B.

Table 7.

Summary of mercury concentrations in sediments at Louisiana sites under fish consumption advisory. Louisiana Department of Environmental Quality, Environmental Planning Division. 1994-December 2000.

Site No.	Site Name	N	Mean
0013	Ouachita River at Sterlington, Louisiana	1	0.259
0064	Bogue Chitto near Bush, Louisiana	3	0.023
0089	Little River southwest of Jena, Louisiana	2	0.089
0308	Bayou Des Cannes northeast of Jennings, Louisiana	4	0.067
0366	Black Lake north of Natchitoches, Louisiana	5	0.206
0377	Pearl River near Bogalusa, Louisiana	2	0.107
0379	Lake Chicot south of St. Landry, Louisiana	4	0.227
0436	Lake Henderson, east of Henderson, Louisiana	17	0.112
0437	West Fork Calcasieu River north of Westlake, Louisiana	1	0.078
0468	Pearl River (West) east of Slidell, Louisiana	2	0.077
0503	Bayou Liberty near Slidell, Louisiana	3	0.3
0504	Bayou Plaquemine Brule near Mermentau, Louisiana	4	0.141
0507	Bogue Chitto near Clifton, Louisiana	2	0.001
0522	Vernon Lake, south of Anacoco, Louisiana	4	0.079
0529	Toledo Bend Reservoir near Hunter, Louisiana	4	0.098
0531	Toledo Bend Reservoir near San Patrice, Louisiana	5	0.332
0538	Blind River near Gramercy, Louisiana	3	0.33
0539	Pearl River near Bogalusa, Louisiana	1	0.288
0544	Ouachita River near the State Line	1	0.001
0757	Seventh Ward Canal south of Kaplan, Louisiana	3	0.089

0883	Phillips Lake northeast of Crossroads, Louisiana	3	0.149
0911	Bayou Bartholomew at Hwy. 425	2	0.029
0964	Ivan Lake, Louisiana	2	0.154
0986	West Fork Calcasieu River, Louisiana	1	0.07

Table 8.

Summary of mercury concentrations in epiphytes at Louisiana sites under fish consumption advisory. Louisiana Department of Environmental Quality, Environmental Planning Division. 1994-December 2000.

Site No.	Site Name	N	Mean
0013	Ouachita River at Sterlington. Louisiana	1	0.09
0064	Bogue Chitto near Bush, Louisiana	3	0.06
0089	Little River southwest of Jena, Louisiana	2	0.03
0308	Bayou Des Cannes northeast of Jennings, Louisiana	4	0.06
0366	Black Lake north of Natchitoches, Louisiana	5	0.06
0377	Pearl River near Bogalusa, Louisiana	2	0.14
0379	Lake Chicot south of St. Landry, Louisiana	5	0.08
0436	Lake Henderson, east of Henderson, Louisiana	16	0.04
0437	West Fork Calcasieu River north of Westlake, Louisiana	1	0.03
0471	Toledo Bend Reservoir south of Logansport, Louisiana	1	0
0503	Bayou Liberty near Slidell, Louisiana	3	0.23
0504	Bayou Plaquemine Brule near Mermentau, Louisiana	4	0.12
0507	Bogue Chitto near Clifton, Louisiana	1	0
0522	Vernon Lake south of Anacoco, Louisiana	1	0
0538	Blind River near Gramercy, Louisiana	4	0.03
0539	Pearl River near Bogalusa, Louisiana	1	0
0603	Toledo Bend southwest of Logansport, Louisiana	1	0.97
0883	Phillips Lake northeast of Crossroads, Louisiana	3	0.08
0911	Bayou Bartholomew at Hwy. 25	2	0.09
0986	West Fork Calclasieu River, Louisiana	1	0.2

Additional Information

For additional information on mercury contamination of water bodies and fish please contact the Louisiana Department of Health and Hospitals at (504) 568-8537, or the Louisiana Department of Environmental Quality at (225) 765-0246. A hotline number has also been established to provide current mercury advisory information. That number is 1-888-293-7020. The Website for LDEQ is located at http://www.deq.state.la.us. Raw data for each mercury sample site is located on the Website or this data can be requested directly by calling (225) 765-0246. EPA's *1997 Mercury Report to Congress* is available on EPA's Website. This report cites a detailed strategy for eliminating mercury use in industry. EPA also has a report entitled *Mercury Sources and Regulations, 1999 Update*. This report can be found at www.epa.gov/grtlakes/bns/mercury/stephg.html. Although the report is draft as of this writing, it contains a great deal of information on sources of mercury in the environment and current regulations to control it. You can contact the United States Environmental Protection Agency at http://www.epa.gov. The address for EPA Headquarters is:

Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

For EPA Region 6 the phone number is (214) 665-6444, and the address is:

Environmental Protection Agency
Fountain Place 12th Floor, Suite 1200
1445 Ross Ave.
Dallas, TX 75202-2733.

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